a presumption that the butter is not genuine. In its first report the committee, which was a large and representative one, consisting of analysts, producers, vendors, and public officials connected with the English and Irish Boards of Agriculture, under the chairmanship of Sir Horace Plunkett, after hearing evidence in this country and in Ireland, unanimously recommended the adoption of a limit of 16 per cent. for the proportion of water, and this recommendation was promptly given effect to in the Sale of Butter Regulations 1902.

In the present report the committee deals with the other matters referred to it. These questions have led it to inquire into the chemical nature of butter, to ascertain how far the composition of butter-fat is dependent upon conditions of production and within what limits it may vary. It has also had to inquire into the nature of the substances which may be used for the purpose of adulterating butter, and what methods are open to analysts to detect and determine the extent of such adulteration.

The space at our disposal precludes any attempt to deal in detail with the many interesting points connected with the chemical nature of butter which have come out in the course of the inquiry. Observation has shown that the chemical constitution of butter-fat is dependent to a certain extent upon climatic conditions, period of lactation, nature and amount of food, breed and idiosyncrasy of the cow. The extent to which its composition may vary from these several causes is shown in the evidence which was taken, and which is summarised in the report.

The majority—one member, a butter vendor, alone dissenting—were of opinion that for the purposes of the Sale of Food and Drugs Act 1899 it was expedient to recommend a limit or "standard" based on a deficiency in the normal constituents of butter, and that it was desirable that the limit should have regard to what all authorities are agreed are the characteristic constituents of butter-fat, namely, the volatile acids, which by general consent is by far the most important criterion in butter analysis. They recommend, therefore, that if the amount of the volatile acids in any sample of butter, as determined by the Reichert-Wollny method—a description of which is appended in a schedule to the report—should fall below the number 24, a presumption should be raised that the butter is not genuine. Two members of the committee are disposed to place the limit at 23.

The committee is strongly impressed with the necessity of taking such steps as would directly identify margarine if present in butter, and with this view it recommends that all margarine made or imported into this country should be "ear-marked," as is done in Germany, Austria, and Belgium, and as it is proposed should be done in France, by the addition of 10 per cent. of sesamé oil during its manufacture.

It further suggests that steps should be taken to give effect to the recommendations of the Dairy Congress held at Brussels on April 27 and 28, 1902, to secure international agreement on the subject of control of the manufacture of butter and margarine. In a large number of the countries producing butter for sale in this country a system of control more or less well organised and under State authority already exists, and there ought to be little difficulty in securing by international cooperation and agreement that the system should be uniform and effective.

It remains to be seen what the Minister of Agriculture will do with a report which is particularly interesting as a contribution to the literature of a subject of great importance to the community, and is evidently the carefully digested result of an exhaustive and complicated inquiry.

THE JANUARY METEORS.

THESE meteors shoot from a point at about 230°+53° in Bode's modern constellation Quadrans Muralis, placed in the barren region between Boötes, Draco, and Hercules. But the former constellation has never been generally recognised and admitted into recent star-maps. The name "Boötids" has, in fact, been sometimes suggested as preferable to "Quadrantids" for this new-year meteor-shower.

In 1904 the meteors will probably return in their greatest abundance on the nights following January 3 and 4, but the moon will unfortunately be full, and only the brighter members of the shower will be visible. But watches of the sky should be maintained on the early evenings of January 3 and 4, and also on the mornings of those dates (between about 5 and 7 a.m.) if the weather is sufficiently clear. A few large meteors are sure to be visible, notwithstanding the strong moonlight. In some years, when all the conditions are favourable, the display of January meteors is as plentiful as that observed during an average Perseid shower. The really active period of the Quadrantids (or Boötids) is usually very brief, being confined to a few hours. Meteors in the front of the stream begin to appear on about December 28, and the display seems practically exhausted on January 5 or 6. The radiant has a very low northerly position during the greater part of the night, and the meteors exhibit long flights and moderately swift motions.

W. F. DENNING.

NOTES.

M. ALPHONSE ROBERT, the energetic natural history collector who accompanied Dr. Forsyth Major some years ago in his expedition to Madagascar, and who only returned to England a few months ago from a three years' sojourn in Brazil, has just started on another collecting trip to the latter country, where his first destination is Para. The expenses of both the previous and the present expedition, which are undertaken in the interests of the British Museum, are borne by Mrs. Percy Sladen. M. Robert, we understand, intends to spend some time collecting at Para, and thence to ascend the Amazons into Peruvian territory. The specimens collected by M. Robert during his last trip have done much to increase our knowledge of the mammalian fauna of the Matto Grosso and adjacent districts of Brazil, and the novelties obtained have been from time to time recorded by Mr. O. Thomas in the *Annals of Natural History*. Among these are several new bats (one indicating a new generic type), a squirrel, and a new race of the crab-eating fox (*Canis thous angulensis*). M. Robert has also obtained a fine series of skins of the large and handsome brown woolly spider-monkey (*Brachyteles arachnoides*), a pair of which are now being set up by Mr. Rowland Ward for the British (Natural History) Museum.

THE report submitted at the second annual meeting of the trustees of the Carnegie Institution, held in Washington recently, shows that sixty-six grants were made by the executive committee for scientific research, amounting to an aggregate sum of 30,000*l*., the recipients of which represent every part of the United States and the smaller colleges as well as the large universities, observatories and laboratories. Twenty-five research assistants were appointed. These sums are exclusive of administrative and incidental expenses of the Institution. Arrangements have been made for publication at an early day of eleven scientific papers, most of them making large and costly volumes. Among the subjects now under consideration by the Institution in connection with grants are a solar observatory, southern observatory, geophysical laboratory, Transcaspian exploration and archæological exploration, exploration in the south Pacific, establishment of biological experiment laboratories and international magnetic researches. The trustees authorised an aggregate expenditure of 75,000*l.* in grants for scientific researches and 8000*l.* for publications during the ensuing year.

THE large gold medal for services rendered to art and science has been awarded by the German Government to Prof. Ehrlich.

THE French Minister of Public Instruction has been authorised, says *La Nature*, to prepare a Bill arranging for the creation of a chair of general physics in connection with the science faculty of the University of Paris. This chair is intended for M. Curie.

A REUTER message from Stockholm announces that Baron Erland Nordenskjöld's expedition to Peru and Bolivia will leave for Southampton on January 6. It will proceed thence to Panama, and will arrive about February 15 at La Paz, the capital of Bolivia, which will be the departing point for the expedition to Lake Titicaca.

THE Brothers Kearton have arranged to hold an exhibition of enlarged photographs of birds, beasts, reptiles, and insects at the Modern Gallery, Bond Street, W., on January 2–12, 1904, inclusive. The Gallery will be open from 10 a.m. until 9 p.m., and Mr. R. Kearton will deliver limelight lectures to children each afternoon, and to adults in the evening.

THE death on December 19 at Hove of Mr. John Henry Brown recalls the little-known fact that, as the inventor of the iris diaphragm, he has laid the scientific world under a considerable obligation. "In the early seventies," Dr. Hollis writes from Hove, "he took his home-made model to Smith and Beck, the predecessors of the well-known firm of opticians in Cornhill. This model he showed me, many years ago, and although roughly constructed it differed in no important detail from the type of apparatus at present in the market. As he did not patent the little contrivance he reaped no pecuniary reward for his ingenuity. Although frail in body and physically somewhat infirm, Mr. Brown by indomitable energy made and retained for many years a large practice as a dental surgeon. He was a fellow of the Royal Astronomical Society, and died aged sixty-seven much respected."

THE President of the Board of Agriculture and Fisheries has appointed a departmental committee to inquire into and report upon the present position of fruit culture in Great Britain, and to consider whether any further measures might with advantage be taken for its promotion and encouragement. The committee is constituted as follows:—Mr. A. G. Boscawen, M.P., chairman, Mr. C. W. Radcliffe Cooke, Mr. J. M. Hodge, Colonel Charles W. Long, M.P., Mr. George Monro, Mr. P. Spencer Pickering, F.R.S., Dr. W. Somerville, an assistant secretary of the Board of Agriculture and Fisheries, Mr. Edwin Vinson, and Rev. W. Wilks, secretary of the Royal Horticultural Society. Mr. Ernest Garnsey, of the Board of Agriculture and Fisheries, will act as secretary to the committee.

AT the meeting of the Institution of Civil Engineers on December 22, Dr. T. E. Stanton described experiments made in the engineering department of the National Physical Laboratory on the distribution and intensity of the pressure on thin plates and combinations of plates placed in a uniform current of air. The results show that, under the given experimental conditions, a definite relation existed and may be stated thus:—For similar and similarly situated plates or combinations of plates in a uniform current of air, the intensity of pressure is the same for the same velocity of current and general atmospheric conditions. On the assumption that the motion of the wind approximates to that of a uniform current, the distribution and intensity of the pressure of the wind on structures may be studied experimentally by means of models of the structures set up in a current of air produced by means of a fan. In illustration of this, the results of experiments made on models of roofs and lattice girders of simple form were given. Tabulated results are also given for the cases of parallel plates at varying distances apart, plates inclined at varying angles to the direction of the current, and rectangular plates of varying ratio of length to width.

MR. R. G. CARRUTHERS and Mr. G. W. Grabham have been appointed geologists on the Geological Survey of the United Kingdom.

MR. L. M. LAMBE has given a description of the lower jaw of Dryptosaurus obtained from the Cretaceous strata of north-western Canada (*Ottawa Naturalist*, xvii., November).

IN our brief notice of Mr. R. B. Newton's article on fossils from Borneo (NATURE, December 10, p. 139) it should have been distinctly stated that Trigonia was for the first time recorded from the Jurassic rocks of that island. The genus had previously been recorded from the Cretaceous strata of Borneo.

IN the *Annals* of the South African Museum (vol. iv., part ii., November) there is a series of articles by Dr. R. Broom on fossil reptilian remains collected by officers of the Geological Survey of Cape Colony. He describes an almost perfect skeleton of *Pareiasaurus serridens*, some new theriodonts, including three new genera, also a new and primitive rhynchocephalian from the Karroo beds. This last reptile is named Proterosuchus, and it shows a considerable degree of specialisation along the line which gave rise to the early crocodiles and dinosaurs.

IN the *Proceedings* of the Cotteswold Naturalists' Field Club (vol. xiv. part iii., November) there is an interesting historical and geographical article on the Cotteswold Hills by Mr. S. S. Buckman, who deals with the origin of the name and the area to which it should properly be restricted. Messrs. T. Pears and L. Richardson describe some alluvial deposits at Clifton Hampden, near Oxford, and Messrs. A. S. Kennard and B. B. Woodward contribute notes on the land and fresh-water Mollusca found in the deposits. Among the species it is interesting to note *Dreissensia polymorpha*, as the occurrence of this mollusc in Britain was first observed in 1824, when living examples were found in the Commercial Docks, and it was held that the species had been imported.

IN the *American Journal of Science* (December) Mr. G. R. Wieland discusses Polar climate in reference to the evolution of plants and animals, expressing the view that the northern circumpolar area has probably been, ever since the older Palæozoic era, the main evolutionary centre from which animal and plant life have radiated. In the same journal Mr. J. C. Branner directs attention to the resemblance between the Peak of Fernando de Noronha and the intrusive plug or obelisk of Mont Pelée, in Martinique, described by Dr. Hovey. He also quotes an interesting passage from Darwin's "Journal," in which the author remarked of the Fernando Peak that "at first one is inclined to believe that it has been suddenly pushed up in a semi-fluid state."

THE veteran traveller, Baron F. von Richthofen, selected a geographical subject for his inaugural address as rector of the University of Berlin (*Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1903, p. 655). In dealing with the motives and course of geographical inquiry in the nineteenth century, he includes a considerable review of the work of early explorers. Twenty pages, indeed, have passed before we come to the final fourteen in which his true subject is discussed. The personal aims and influence of the rector are thus somewhat modestly and rigidly suppressed, and the address assumes a strictly academic character. It is well pointed out that tales of fabulous gold have prompted a large part of exploration. Yet geographical discovery, from whatever motive, has ended in that widening of the field of view which forms the essential feature of human progress. The promoters of colonial enterprise, it is urged, commonly overlook this incalculable result of their endeavours. The author traces the rise of scientific geography from the stage of mere universal description, and points out how the culture of Germany has allotted its proper place in the university curriculum to a subject so intimately connected with the search after truth and the welfare of mankind.

IN the *Physical Review* for October Mr. Edgar Buckingham gives a concise deduction of Stefan's law, according to which the total temperature radiation of a black body is proportional to the fourth power of the absolute temperature. This deduction, which is a modification of Boltzmann's, is based on the free energy principle, but the corresponding reciprocal thermodynamical relation can be used instead if preferred.

DR. MARAGE publishes a series of observations on the artificial development and measurement of the sense of hearing in deaf mute subjects. A considerable number of cases were experimented on, a vowel-syren producing the sounds ou, o, a, é, i being adopted for the purpose, and curves were drawn showing the intensity of sound audible to the patients at different stages of the treatment, as measured by the air pressure necessary to render the sounds of the syren audible. The author maintains that there are but few subjects who are deaf and dumb beyond all cure, and that the use of the syren will often restore the power of hearing, even in cases of complete deafness, usually within about six weeks. The sounds, so far from being fatiguing or painful to the subjects, appear to give them genuine pleasure.

PROF. GIACOMO CIAMICIAN has published his inaugural address delivered in the University of Bologna on November 7, dealing with the problems of chemistry of the new century. After giving a general survey of recent advances in chemistry and physics, the author turns his attention to the problem of developing chemical industries in Italy. Already enormous strides have been made in the manufacture of iron and steel, of sulphuric acid (the production of which has increased fivefold in ten years), of sugar (in which the increase in five years has been from 50 to 800 thousand quintals), and of calcium carbide. Among the obstacles to further progress mentioned by the author are the action of the Government in checking the growth of new industries by excessive taxation, the timidity of capitalists, and the want of educational institutions for training an efficient army of expert chemists.

AT the meeting of the Asiatic Society of Bengal at Calcutta on December 2, Mr. T. H. Holland exhibited a meteorite which fell with the meteor seen in eastern Bengal on October 22. The stone weighs 622 grammes, and is covered with a thin black crust formed by the fusion of the rock during its rapid flight through the air. Several stones were known to have fallen with this meteor, and the complete investment with fused crust of the one exhibited shows that fusion of the surface occurred after the break-up of the meteorite. Besides the complete proof that the meteor resulted in an actual fall of stones, special interest attaches to this occurrence on account of the observations made from so many points of view permitting the actual path and speed of the object to be calculated. At the same meeting Mr. D. Prain read papers on an undescribed Indian Musa and on an undescribed araliaceous genus from Upper Burma.

THE October number of the *Journal* of the Royal Horticultural Society contains a brief description, with some illustrations, of a number of trees and shrubs recently introduced from China by Mr. Veitch, which seem to be suited to our climate, and may prove to be important acquisitions to our garden plants. As Mr. Veitch states, they have been chosen from the collections made by his agent, Mr. E. H. Wilson, and bear testimony to the latter's energy and assiduity. In the same volume the practice of watering cucumbers and tomatoes with copper sulphate in order to ward off fungal diseases is recommended by Mr. G. Massee.

THE primary function of the park and garden committees in our cities and towns is to provide ornamental and open spaces. The members of the Bradford Parks Committee have recognised that it is within their province to afford educational facilities, and have set apart a plot of land in Lister Park to be converted into a botanical garden in which to present a systematic grouping of plants, and also to grow trees, and local or economic plants which will serve for the purpose of identification. It is within the scope of this scheme to provide material for teachers' use and to establish informal public lectures at which more interesting specimens can be shown and discussed.

IN No. 6 of the *Publications* of the Conseil Permanent International pour l'Exploration de la Mer, issued at Copenhagen, Mr. H. M. Kyle describes a trawl-net designed to work in mid-water as well as on the sea-bed. This net, which is constructed on the umbrella principle, has been tried on one occasion at Grimsby, and, although the results were not entirely successful, may quite possibly prove efficient.

WE have to acknowledge the receipt of the second part of Mr. J. Macoun's "Catalogue of Canadian Birds," published by the Geological Survey of Canada. This part includes the diurnal birds of prey, together with the woodpeckers, flycatchers, crows, jays, and American blackbirds (Agelæus). Three years have elapsed since the publication of part i. (which was noticed at the time in our columns), during which period much additional information has been acquired with regard to the distribution of Canadian birds; consequently this portion of the subject is somewhat more amplified in the present part than was the case in its predecessor. Otherwise, the mode of treatment follows the original lines.

WE have received copies of the first six numbers of a series of circulars on agricultural economic entomology, in course of issue by the Trustees of the Indian Museum, Calcutta. Each number is devoted to a single species of insect, of which it contains an illustration. In each instance the general appearance and mode of work of the insect are described, after which we have its distribution, food, and ravages, followed by a brief account of its general habits, and concluding with suggestions for remedial measures. No. 4 deals with the date-palm, or Indian rhinoceros-beetle, of which both the grub and the adult insect inflict very serious damage on the tree after which the species is named. The next part treats of the north-west, or migratory, locust, of which the distribution within the limits of the Indian Empire is shown on a map.

IN the December issue of the *Quarterly Journal of Microscopical Science* Prof. Ray Lankester figures for the first time a couple of small blind crabs of the genus Cymonomus (or Ethusa) taken so long ago as the cruise of the *Porcupine* (1869–70), and described by Canon Norman in 1873. The main reason for bringing these specimens into prominence is owing to a statement in a popular work that they belong to a species of which the form inhabiting shallow water has functional eyes, while as we proceed deeper and deeper the eye-stalks are found to be more degenerate. The statement that an eyed form exists is apparently a misconception, while the idea that the one in which the eye-stalks are the most modified inhabits deeper water than the other is likewise not well founded. As a matter of fact, Prof. Lankester believes the two specimens to indicate distinct species. The other contents of this serial include a discussion on the origin of the green cells found in a turbellarian worm (*Convoluta roscoffensis*) peculiar to Brittany, by Messrs. Gamble and Keeble, and a note by Dr. Hanna on the presence of Trypanosoma parasites in the blood of certain Indian birds. In a third article, Mr. H. M. Bernard continues the account of his investigations into the structure of the retina, dealing in this instance with the continuity of the retinal nerves throughout the Vertebrata.

IN 1902 Mr. R. Lydekker, F.R.S., read before the Zoological Society (see *Proceedings* Zoological Society, 1902, p. 981) the description of a new antelope from the neighbourhood of Lake Mwero, in northern Rhodesia. Mr. Lydekker supposed it to belong to the genus Cobus, although, as the only specimen consisted of a flat skin without head and feet, he was not quite certain where it should be placed, and named it *Cobus smithemani,* after Mr. F. Smitheman, who had obtained the specimen. Fresh and more perfect examples of this antelope have lately been received by Mr. Walter Rothschild, who has presented one of them to the British Museum. This specimen, which may now be seen mounted in the gallery, shows that Mr. Lydekker was quite correct in his judgment, and that Smitheman's antelope is a strongly marked new form of the "Kob" group, easily distinguished from the Poku or Vardon's antelope by its black neck and dark chestnut sides.

THE re-introduction of cotton cultivation into the British possessions on the Spanish Main is regarded as of sufficient importance to justify the devoting of the whole of the third part of vol. iv. of the *West Indian Bulletin* to the subject. One-third of the number contains reprints of articles, or portions of articles, in the "Encyclopædia Britannica" and in various publications of the United States Department of Agriculture. The remaining two-thirds gives much useful information bearing upon the cultivation of cotton in St. Kitts, Antigua, Montserrat, Barbados, and Carriacou; an article by Prof. d'Albuquerque on the agricultural chemistry of cotton; one by Mr. Lewton-Brain on the fungoid diseases of cotton; and an illustrated article by Mr. Henry A. Ballou on insects attacking cotton in the West Indies. Sir Daniel Morris, accompanied by Mr. Bovell, has spent the autumn in the southern States of America making an exhaustive examination of the methods of cultivation, and the preparation for market, of the Sea Island variety of cotton. The results of the investigation will be published as an extra number of the *West Indian Bulletin,* Sea Island cotton being thought to be the most suitable for the islands

UNDER the title of "The Case for Vaccination," Mr. C. E. A. Winslow gives an admirable survey of the statistical data in favour of the efficacy of vaccination (*Science*, July 24, p. 101). It points out that a single vaccination greatly reduces the probability of an attack of small-pox, postpones it to a later period of life, and renders it less dangerous if it does ensue. To ensure absolute protection revaccination is required. During the small-pox epidemic of 1871, of 734 nurses and attendants in the Metropolitan Asylums Board Hospitals 79 were survivors from small-pox attack, and escaped infection; 645 were revaccinated on entrance, and all escaped; 10 were not revaccinated, and all took small-pox. Mr. Winslow concludes, "if statistics ever proved anything, those quoted prove the protective influence of vaccination. If any fact in science is certain, it is that a successful vaccination absolutely prevents small-pox for a period of from seven to ten years, that after that period it renders the disease less fatal, and that its complete protective effect may be renewed by revaccination. The conclusion is obvious not only that the State should oblige primary vaccination, but that a second vaccination at the age of twelve ought to be made compulsory."

THE latest addition to the convenient little scientific memoirs published in the "Scientia" series by M. C. Naud, of Paris, is a translation of two papers by Prof. J. Willard Gibbs which appeared in 1873 in the *Transactions* of the Connecticut Academy, and have become scientific classics. "Diagrammes et Surfaces thermodynamiques," as the book is entitled, is by M. G. Roy, of the University of Dijon, and the translation is preceded by a biographical notice of Prof. Gibbs by M. B. Brunhes, of the University of Clermont.

MR. WILLIAM TAYLOR has recently circulated a pamphlet with the title "The Science of the Engineering Workshop," in which he urges the need for making scientific knowledge readily available to those at work in engineering shops. He then proceeds to trace—under the three headings, materials, processes, and tools—the foundation and outline of this science of the workshop. The publication concludes with the syllabus of a course of instruction, largely the work of an advisory committee of engineers, in the science of the workshop which is in use at the Leicester Municipal Technical Schools.

THE annual report of the Smithsonian Institution for the year ending June 30, 1902, has reached us, and an examination of the volume shows it to be of the same valuable character as its predecessors. The proceedings of the Board of Regents, the report of the executive committee, and the annual report of the secretary are followed by the usual interesting general appendix. The appendix constitutes nearly five-sixths of the whole contents of the volume, and comprises brief accounts of scientific discoveries in particular directions during the year with which the report is concerned, and the method adopted is to present a miscellaneous selection of papers embracing a considerable range of scientific investigation and discussion. Many of these contributions are familiar to readers of NATURE, since some of the papers have already appeared in these columns, and others have been published in the *Transactions* of British scientific societies. Among the reprinted articles we notice—to name a few—Prof. Dewar's British Association presidential address on the history of cold and the absolute zero; Prof. J. G. McKendrick's contribution to the study of experimental phonetics; Dr. J. J. H. Teall's address on the evolution of petrological ideas; and Mr. H. G. Wells's Royal Institution lecture on the discovery of the future. There are several translations from French and German of important papers also included, such as Prof. A. Dastre's article in the *Revue des deux Mondes* on the life of matter; Dr. Georg Jacob's "Oriental Elements of Culture in the Occident" from the German; and Herr Oscar Israel's appreciation of Virchow from the *Deutsche Rundschau*. Like all similar publications from the Smithsonian Institution, the volume is provided with many excellent illustrations.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JANUARY, 1904:—

Jan. 3–4. Epoch of the January meteors (Radiant 230° +53°).
5. 10h. 13m. to 11h. 9m. Moon occults *o* Leonis (mag. 3·8).
12. 10h. 11m. Minimum of Algol (β Persei).
,, 15h. 0m. Ceres in conjunction with moon. Ceres 0° 58′ N.
15. Venus. Illuminated portion of disc =0·707.
,, 6h. 58m. Minimum of Algol (β Persei).
27. 0h. 0m. Vesta in conjunction with moon. Vesta 0° 21′ N.
28. 4h. 55m. to 8h. 8m. Transit of Jupiter's Sat. III. (Ganymede).
,, 8h. 0m. Venus in conjunction with Uranus. Venus 1° 47′ N.

EPHEMERIS FOR WINNECKE'S COMET.—A second part of the ephemeris for the 1903–4 appearance of Winnecke's comet is published by Herr C. Hillebrand in No. 3916 of the *Astronomische Nachrichten*, from which the following has been taken:—

Ephemeris 12h. (*M.T. Berlin*).

1904	α app. h. m. s.	δ app. ° ′ ″	log. *r*	log. Δ
Jan. 0	17 30 51	−17 46 46	9·988836	0·272241
,, 4	17 50 44	−18 39 19	9·981012	0·270012
,, 8	18 10 59	−19 24 20	9·974601	0·268606
,, 12	18 31 32	−20 1 5	9·969782	0·268027
,, 16	18 52 16	−20 28 58	9·966685	0·268248
,, 20	19 13 4	−20 47 33	9·965417	0·269255
,, 24	19 33 50	−20 56 41	9·966004	0·271006
,, 28	19 54 27	−20 56 24	9·968430	0·273468
Feb. 1	20 14 47	−20 46 57	9·972633	0·276601
,, 5	20 34 46	−20 28 49	9·978474	0·280344
,, 9	20 54 18	−20 2 38	9·985794	0·284645
,, 13	21 13 19	−19 29 13	9·994414	0·289439
,, 17	21 31 45	−18 49 25	0·004129	0·294662
,, 21	21 49 35	−18 4 11	0·014739	0·300253
,, 25	22 6 47	−17 14 26	0·026059	0·306155
,, 29	22 23 20	−16 21 3	0·037913	0·312312

SPECTRUM OF MIRA CETI.—In No. 5, vol. xviii., of the *Astrophysical Journal*, Mr. Joel Stebbins, of the Lick Observatory, gives the results of a study of the spectrum of *o* Ceti made with the 36-inch refractor during the period June, 1902, to January, 1903, in which period the magnitude of the star decreased from 3·8 to 9·0. The spectra were obtained with spectrograph i.—which is the Mills spectrograph converted into a one-prism instrument—attached to the 36-inch, and a spark between iron poles was always used as the light source of the comparison spectrum.

The absorption spectrum obtained is not very like the solar spectrum, but the calcium lines *g*, H and K are all present, *g* being comparatively much more intense than in the solar spectrum; the iron lines are not prominent, and even the strongest do not appear when a small dispersion is employed. The *g* line undoubtedly becomes broader as the star grows fainter, for on June 27 (mag.=3·8) its width was 2 t.m., whilst on September 6 (mag.=7·0) it was 9 t.m. The lines at λλ 3990·64, 4045·16, 4093·55 and 4097·08 respectively, which are apparently not coincident with solar lines, appeared at successive intervals during the diminution of magnitude.

A comparison of the several spectra shows that with the decrease in the star's magnitude the continuous spectrum from λ 4300 to λ 5000 becomes relatively fainter than that between λ 4000 and λ 4300.

The bright hydrogen lines are very prominent, and Hβ and Hε, which have been reported as absent by other observers, appear on all the dense negatives, and they appear to grow relatively stronger than the other hydrogen lines, and the continuous spectrum, as the star's magnitude decreases. In addition to the hydrogen lines, bright lines of Si, Mg and Fe are probably present, and numerous changes took place in their relative intensities during the interval covered by the spectrograms. For example, the line at λ 4007 undoubtedly disappeared altogether, whilst the line at λ 4571—possibly due to magnesium—developed in a remarkable manner. The latter did not appear at all until the star's magnitude had fallen to 5·4, and afterwards it became the most prominent feature of the whole spectrum. The evidence obtained supports the conclusion that the bright hydrogen lines disappear at minimum.

Determinations of the star's radial velocity showed that it remains constant at about +66 km., and this is held to be a strong argument against the theory that the light-changes are due to the existence of a companion. The abnormal changes in the relative intensities of the hydrogen lines—which are displaced from their normal positions towards the violet, apparently by other causes than radial velocity and pressure—lead Mr. Stebbins to the conclusion that the light changes are due to internal causes which produce effects that are, as yet, unfamiliar to us.

THE "COMPANION TO THE OBSERVATORY," 1904.—The 1904 edition of the well-known annual compendium of astronomical data, the "Companion to the Observatory," is very similar to that of 1903. It contains, amongst other information, the usual tables for solar, lunar and planetary observations, ephemerides for the various satellites, and minute data regarding a large number of variable stars.

Mr. Denning has contributed a set of notes regarding the principal meteor showers, and Mr. Maw has supplied a list of double-star observations, whilst the numerous variable star ephemerides have been taken from advance proofs supplied by M. Loewy.

OXFORD AND SCIENCE.[1]

WHEN I am tired I sometimes go by train to Reading and cycle over here swiftly in the afternoon, and then I dress and dine comfortably at the *Mitre* and go out for a stroll. Perfect rest is not possible unless there is moonlight, but Oxford is always wonderful and satisfying and restful to an engineer like me. It is not because of its age, of the great men who have studied and worked in its colleges, of its almost unique character and high rank among universities, of the sacred beauty of its colleges and streets. It is because that to me it represents what is most persistent in the constitution of the British Empire. The Houses of Parliament, Westminster Abbey, the Temple and City of London, Windsor, the great mansions of our English nobles, each of these suggests much to any man who is fond of reading, but each suggests only a small part of what Oxford represents.

Now the thing that pervades all my thoughts of Oxford is that more than half of the most distinguished Englishmen during four hundred years have been educated here. And if, as I sometimes do, I include Cambridge when I say Oxford, all the most distinguished Englishmen during four hundred years have been educated here.

Whether we like it or not, it is a fact that England is an aristocratic republic with the King at the head of the

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[1] An address delivered by Prof. John Perry, F.R.S., at a public meeting in Oxford, arranged jointly by the Ashmolean Natural History Society of Oxfordshire and the Oxford Mathematical Society.